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EXAMINER

GRAYBILL, DAVID E

ART UNIT PAPER NUMBER

2827

DATE MAILED: 12/24/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

09/785,194

Applicant(s)

TAKEDA ET AL.

Examiner

David E Graybill

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**The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 11 October 2002.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 25-65 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 25-65 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

**Priority under 35 U.S.C. §§ 119 and 120**

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

**Attachment(s)**

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 12.
- ☒ Interview Summary (PTO-413) Paper No(s). 17.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other:

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The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claim 31 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

In claim 31 the limitation "the support member" is unclear because the limitation refers to a "support member" but there is no apparent previous claim-recitation of a support member.

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless -

(a) the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the applicant for a patent.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

In the rejections infra, reference labels are generally recited only for the first recitation of identical claim language.

Claims 25-30, 33, 36, 48, 49, 52, 55, 58-60 and 63-65 are rejected under 35 U.S.C. 102(a) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Morita (5406124).

At column 3, line 63 to column 4, line 35, column 7, lines 6-9, column 8, lines 1-8 and 24-47, column 9, lines 14-35, column 10, lines 14-15, column 14, lines 3-14 and 40-46, column 16, lines 18-34, column 17, lines 13-14, and column 18, lines 1-10 and 29-30, Morita teaches the following:

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25. A process for fabricating a semiconductor device, comprising the step of: bonding a semiconductor device 1 to a support 2 with an organic die-bonding film 4 at conditions of temperature of 100-250°C ["250°C"] and pressure of 0.1-30 gf/mm<sup>2</sup> ["1 to 50kg/cm<sup>2</sup>"] to produce a bonded chip wherein the organic die-bonding film has a peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher.

26. A process according to 25, further comprising the step of: encapsulating 3 the bonded chip to produce the semiconductor device.

27. A process according to 25, wherein said step of bonding comprises bonding with an organic die-bonding film having a modulus of elasticity of 10 Mpa or less at a temperature of 250°C.

28. A process according to 27, wherein said step of bonding comprises bonding with an organic die-bonding film further having a water absorption of 1.5% by volume or less.

29. A process according to 28, wherein said step of bonding comprises bonding with an organic die-bonding film further having a residual volatile component in an amount of not more than 3.0% by weight.

30. A process according to 29, wherein said step of bonding comprises bonding with an organic die-bonding film further

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having a saturation moisture absorption of 1.0% by volume or less.

33. A process according to 25, wherein said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin.

36. A process according to 25, wherein said die-bonding material is a film comprising a polyimide resin and epoxy resin.

48. A process according to 36, wherein the polyimide is a polyimide synthesized from a combination which is selected from the group consisting of a combination of 1,2-(ethylene)bis(trimellitate anhydride) and bis(4-amino-3,5dimethylphenyl)methane; a combination of 1,2-(ethylene)bis(trimellitate anhydride) and 4,4'-diaminodiphenylether; a combination of 1,2-(ethylene)bis(trimellitate anhydride) and bis(4-amino-3,5-diisopropylphenyl)methane; a combination of 1,2(ethylene)bis(trimellitate anhydride) and 2,2-bis[4-(4-aminophenoxy)phenyl] propane; a combination of a mixture of 1,2-(ethylene)bis(trimellitate anhydride) and 1,10(decamethylene)bis(trimellitate anhydride) being the same mol as the mixture and 2,2bis[4-(4-aminophenoxy)phenyl] propane;

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and a combination of 1,10(decamethylene)bis(trimellitate anhydride) and 2,2-bis[4-(4-aminophenoxy)phenyl] propane.

49. A process according to 25, wherein said step of bonding is carried out with a bonding time of from 0.1 seconds (inclusive) to 2 seconds.

52. A process according to 25, wherein said step of bonding is carried out with a bonding time of from 0.1 seconds (inclusive) to 1.5 seconds.

55. A process according to 25, wherein said step of bonding is carried out at a pressure of 0.1-4 gf/mm<sup>2</sup>.

58. A process according to 49, wherein said step of bonding is carried out at a pressure of 0.1-4 gf/mm<sup>2</sup>.

59. A process according to 52, wherein said step of bonding is carried out at a pressure of 0.1-4 gf/mm<sup>2</sup>.

60. A process according to 25, wherein said step of bonding is carried out at a pressure of 0.3-2 gf/mm<sup>2</sup>.

63. A process according to 49, wherein said step of bonding is carried out at a pressure of 0.3-2 gf/mm<sup>2</sup>.

64. A process according to 52, wherein said step of bonding is carried out at a pressure of 0.3-2 gf/mm<sup>2</sup>.

65. A semiconductor device made by the process of 25.

To further clarify the teaching of a pressure of 0.1-30 gf/mm<sup>2</sup>, it is noted that the teaching of Morita of a pressure of

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1 kg/cm<sup>2</sup> is equivalent to a teaching of a pressure of 10 gf/mm<sup>2</sup>, and a pressure of 10 gf/mm<sup>2</sup> anticipates the claimed pressure. Still further, the unit kg/cm<sup>2</sup> is a conventional alternative expression of the unit kgf/cm<sup>2</sup> as evidenced by Hattori (4990092), at column 9, lines 58-59, and Tsuihiji (6299513), at column 18, line 22. Indeed, this alternate expression is consistent with the teaching of Morita that St. Clair (4543295) teaches "pressure ranges 3 to 21kg/cm<sup>2</sup>," in view of the teaching of St. Clair of pressure ranges of 50 to 300 psi. See Morita, column 2, lines 49-52, and St. Clair, column 4, lines 55-58, column 5, lines 6-8, column 6, lines 56-67, and column 9, lines 1-5.

To further clarify the teaching of a water absorption of 1.5% by volume or less, the teaching of Morita of "less than 1.2%" anticipates this limitation. In particular, although Morita does not appear to explicitly specify whether the measure is by volume or by weight, both specific examples of 1.2% by volume and 1.2% by weight fall within the claimed range. Moreover, both ranges of 1.2% by volume or less and 1.2% by weight or less fall within the claimed range, with the common lower limit of the ranges equal to zero percent.

In the alternative, Morita teaches that percent water absorption is a result-effective variable. Therefore, it would have been an obvious matter of design choice bounded by well



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known manufacturing constraints and ascertainable by routine experimentation and optimization to choose the particular claimed percent water absorption limitation because applicant has not disclosed that the limitation is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical, and it appears prima facie that the process would possess utility using another water absorption. Indeed, it has been held that optimization of range limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See MPEP 2144.05(II):

"Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. '[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.'" In re Aller, 220 F.2d 454, 105 USPQ 233, 235 (CCPA 1955). See also In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969), Merck & Co. Inc. v. Biocraft Laboratories Inc., 874 F.2d 804, 10 USPQ2d 1843 (Fed. Cir.), cert. denied, 493 U.S. 975 (1989), and In re Kulling, 897 F.2d 1147, 14 USPQ2d 1056 (Fed. Cir. 1990). As set forth in MPEP 2144.05(III), "Applicant

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can rebut a prima facie case of obviousness based on overlapping ranges by showing the criticality of the claimed range. 'The law is replete with cases in which the difference between the claimed invention and the prior art is some range or other variable within the claims. . . . In such a situation, the applicant must show that the particular range is critical, generally by showing that the claimed range achieves unexpected results relative to the prior art range.' In re Woodruff, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990). See MPEP § 716.02 - § 716.02(g) for a discussion of criticality and unexpected results."

To further clarify the teaching of the limitation, "to produce a bonded chip wherein the organic die-bonding film has a peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher," it is noted that this limitation is merely a statement of intended result which does not result in a manipulative difference as compared to the process of Morita. Furthermore, because the process of Morita is inherently capable of being used to achieve the same intended result, the statement of intended result does not patentably distinguish the claimed process from the process of Morita.

Because applicant insists on a unique interpretation of the claims; namely that the claimed process results in a peel

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strength of 0.5 kgf/(5 mm x 5mm chip) or higher, and to continue to afford applicant the benefit of compact prosecution, in the alternative, the claims are further rejected over Morita.

In particular, Morita does not appear to explicitly teach that the process results in a peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher. Furthermore, it cannot be determined if the largest explicitly taught peel strength of Morita; namely a 90 degree peel strength of 67g/10mm<sup>2</sup> chip, is equivalent to the claimed peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher because the conversion factor between the two different peel strength measuring techniques cannot be determined.

Nonetheless, as cited, Morita teaches all of the process limitations that result in the claimed peel strength; therefore, the claimed peel strength is an inherent result of the process of Morita.

In any case, Morita teaches that an increase in peel strength is desirable. Hence, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose the particular claimed peel strength range because applicant has not disclosed that the range is for a particular unobvious purpose, produces an unexpected result, or is otherwise critical, and it appears prima facie that the

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product and process would possess utility using another range. As set forth supra, it has been held that optimization of range limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical.

Claims 31, 32, 34, 35, 37, 38, 50, 51, 53, 54, 56, 57, 61 and 62 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morita as applied to claims 25-30, 33, 36, 48, 49, 52, 55, 58-60 and 63-65, and further in combination with Hozoji (JP5-218107).

Morita does not appear to explicitly teach the following:

31. A process according to 30, wherein said step of bonding comprises bonding with an organic die-bonding film further having a void volume of 10% or less in terms of voids present in the material and at an interface between said film and said support at a stage where the semiconductor has been bonded to the support member by the film.

Nonetheless, in the English abstract and Table 1, Hozoji teaches wherein a step of bonding comprises bonding with an organic die-bonding film further having a void volume of 10% or less in terms of voids present in the material and at an interface between said film and said support at a stage where the semiconductor has been bonded to the support member by the

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film. Moreover, it would have been obvious to combine the process of Hozoji with the process of Morita because it would facilitate adhesion.

To further clarify the teaching of a void volume of 10% or less, it is noted that Hozoji teaches that a defect such as a void, etc., is eliminated.

In addition, in the combination, Morita teaches the following:

32. A process according to 31, further comprising the step of: encapsulating the bonded chip to produce the semiconductor device.

34. A process according to 31, wherein said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin.

35. A process according to 32, wherein said die-bonding material is a film comprising one or more resins selected from the group consisting of silicone resin, acrylic resin, polyimide resin and epoxy resin.

37. A process according to 31, wherein said die-bonding material is a film comprising a polyimide resin and epoxy resin.

38. A process according to 32, wherein said die-bonding material is a film comprising a polyimide resin and epoxy resin.

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50. A process according to 31, wherein said step of bonding is carried out with a bonding time of from 0.1 seconds (inclusive) to 2 seconds.

51. A process according to 32, wherein said step of bonding is carried out with a bonding time of from 0.1 seconds (inclusive) to 2 seconds.

53. A process according to 31, wherein said step of bonding is carried out with a bonding time of from 0.1 seconds (inclusive) to 1.5 seconds.

54. A process according to 32, wherein said step of bonding is carried out with a bonding time of from 0.1 seconds (inclusive) to 1.5 seconds.

56. A process according to 31, wherein said step of bonding is carried out at a pressure of 0.1-4 gf/mm<sup>2</sup>.

57. A process according to 32, wherein said step of bonding is carried out at a pressure of 0.1-4 gf/mm<sup>2</sup>.

61. A process according to 31, wherein said step of bonding is carried out at a pressure of 0.3-2 gf/mm<sup>2</sup>.

62. A process according to 32, wherein said step of bonding is carried out at a pressure of 0.3-2 gf/mm<sup>2</sup>.

Claims 39, 42 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Morita as applied to claims 25-30, 33,

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36, 48, 49, 52, 55, 58-60 and 63-65, and further in combination with Sakumoto (5277972).

Morita does not appear to explicitly teach the following:

39. A process according to 25, wherein said die-bonding material is a film comprising an acrylic resin and epoxy resin.

42. A process according to 25, wherein said die-bonding material is a film comprising a silicone resin.

45. A process according to claim 25, wherein said die-bonding material is a film comprising a silicone resin and epoxy resin.

Nevertheless, at column 1, lines 14-17, column 2, lines 11-13, and column 9, lines 26-29, Sakumoto teaches a process wherein a die-bonding material is a film comprising an acrylic resin, an epoxy resin, and a silicone resin. Moreover, it would have been obvious to combine the process of Sakumoto with the process of Morita because it would provide an adhesive material.

Although Sakumoto does not appear to explicitly teach the particular claimed combinations of acrylic and epoxy resin, and silicone and epoxy resin, these combinations would have been an obvious matter of routine observation and experimentation.

Indeed, "It is prima facie obvious to combine two compositions each of which is taught by the prior art to be useful for the same purpose, in order to form a third composition to be used for the very same purpose . . . . [T]he idea of combining them

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flows logically from their having been individually taught in the prior art." In re Kerkhoven, 626 F.2d 846, 205 USPQ 1069, 1072 (CCPA 1980) (citations omitted) (Claims to a process of preparing a spray - dried detergent by mixing together two conventional spray - dried detergents were held to be prima facie obvious.). See also, In re Crockett, 279 F.2d 274, 126 USPQ 186 (CCPA 1960) (Claims directed to a method and material for treating cast iron using a mixture comprising calcium carbide and magnesium oxide were held unpatentable over prior art disclosures that the aforementioned components individually promote the formation of a nodular structure in cast iron.); and Ex parte Quadranti 25 USPQ2d 1071 (Bd. Pat. App. & Inter. 1992) (Mixture of two known herbicides held prima facie obvious).

Claims 40, 41, 43, 44, 46 and 47 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of Morita and Hozoji as applied to claims 31, 32, 34, 35, 37, 38, 50, 51, 53, 54, 56, 57, 61 and 62, and further in combination with Sakumoto (5277972).

Sakumoto is applied for the same reason it was applied to claims 39, 42 and 45.

The Declaration under 37 CFR 1.132 filed 6-25-2 is insufficient to overcome the rejection of claims 25-65 for the following reasons:



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The Declaration is insufficient because it refers only to the system described in the instant application and not to the individual claims of the application. Thus, there is no showing that the objective evidence of nonobviousness is commensurate in scope with the claims. See MPEP § 716.

The Declaration is also insufficient because the objective evidence of nonobviousness is not commensurate in scope with the claims. In particular, the showing of unexpected results are not reviewed to determine whether the results occur over the entire claimed range. In re Clemens, 622 F.2d 1029, 1036, 206 USPQ 289, 296 (CCPA 1980).

Similarly, the Declaration is insufficient because it does not compare the claimed invention with the closest prior art which is commensurate in scope with the claims. For example, a polyimide of the claimed invention is compared to a different polyimide of the "closest" prior art; yet, both the closest prior art and the instant claims recite an identical polyimide. For that matter, as set forth in the rejection, Morita explicitly teaches all of the process limitations of the instant claims; therefore, the closest prior art of Morita includes all of the limitations of the claims.

Also, in the remarks filed 10-11-2, applicant admits that it cannot be determined if the teaching of Morita of a 90 degree

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peel strength of 67g/10mm<sup>2</sup> chip is equivalent to the claimed peel strength. Yet applicant also declares that the claimed peel strength is an unexpected result in relation to the peel strength of Morita. This declaration of unexpected results is respectfully traversed because the claimed result cannot be declared unexpected in relation to the peel strength of Morita when the relationship to the peel strength of Morita cannot be determined.

In any case, at column 7, lines 65-68, Morita teaches unexpected results; therefore, the unexpected results alleged in the Declaration are not unexpected.

In view of the foregoing, when all of the evidence presented in the Declaration is considered, the totality of the rebuttal evidence of nonobviousness fails to outweigh the evidence of obviousness.

Applicant's amendment and remarks filed 6-25-2 and 10-11-2 have been fully considered, are addressed in the rejection supra and are further addressed infra.

Also, applicant alleges that the Office "admits that the Morita reference does not disclose a '17 degree peel strength of 0.5 Kgf/5mm x 5mm chip or above [sic]." This allegation is respectfully traversed because this is not admitted; rather, it is maintained that "Morita does not appear to explicitly teach

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that the process results in a peel strength of 0.5 kgf/(5 mm x 5mm chip) or higher."

The art made of record and not applied to the rejection is considered pertinent to applicant's disclosure. It is cited primarily to show inventions similar to the instant invention.

***Any telephone inquiry of a general nature or relating to the status (MPEP 203.08) of this application or proceeding should be directed to Group 2800 Customer Service whose telephone number is 703-306-3329.***

Any telephone inquiry concerning this communication or earlier communications from the examiner should be directed to David E. Graybill at (703) 308-2947. Regular office hours: Monday through Friday, 8:30 a.m. to 6:00 p.m.

The fax phone number for group 2800 is 703/3087724.



David E. Graybill  
Primary Examiner  
Art Unit 2827

D.G.  
19-Dec-02